RECORD OF SOCIETY OF ACTUARIES
1994 VOL. 20 NO. 1

ARE WE PREPARED FOR INTEREST RATES TO RISE AGAIN?

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Many of today's insurance and investment products have been developed and managed only during an extended period of stable to declining interest rates. Double-digit interest rates and inverted yield curves are, for many actuaries and portfolio managers, only a vague or nonexistent memory. Are we prepared for change in this environment? This session will focus on the possible impacts of a return to higher interest rates and explore risk management strategies that may be appropriate.

MR. RANDALL L. BOUSHEK: In the fall of 1993 both long-term and short-term interest rates were at 30-year historical lows. Bond calls, mortgage prepayments and reinvestment risk were at or near the top of every portfolio manager's list of concerns. Rising interest rates was a genuine concern, but was thought to be a longer term risk. It was at about that time that I was asked to put together a panel for this discussion. Little did I know! What started out last October as simply an interesting topic has since become a very timely one as well.

As an introduction to this session, I'd like to provide a bit of historical data on interest rates. Chart 1 illustrates the path of the ten-year constant maturity Treasury (CMT) yield and an exploded view of the path over the six-month period of October 1993 to April 1994. You will note that while interest rates remain quite low relative to recent historical levels, yields have nonetheless risen by a rather dramatic 150 basis points since October, with the ten-year CMT currently quoted at 7.03%.

What's more striking than changes in the level of interest rates are changes in the relationship of short-term to long-term interest rates, i.e., changes in the shape of the yield curve. Chart 2 illustrates the path of the difference between two-year and thirty-year CMT yields over the same ten-year and six-month periods. After rising dramatically from a negative (inverted) spread in 1989 to a peak in excess of 350 basis points in mid-1992, the spread has since declined to approximately 180 basis points, and the last six months have shown a continuation of that trend. In addition to its background value for this presentation, the shape of the yield curve is also significant because of its statistical correlation to subsequent changes in interest rates. Table 1 shows the relationship of the yield curve slope to subsequent changes in the ten-year CMT yield over a forty-year period, as well as the inconsistent coincident relationship of GDP growth to changes in interest rates.

Tables 2 and 3 provide some additional historical data that is specific to the life insurance industry. Table 2 shows the average composition of life company investment portfolios ten years ago and today (actually December 31, 1992, which is the most recent date available), based on data collected by the American Council of Life Insurance (ACLI). Note that the data is inclusive of separate accounts, which does tend to color it just a bit. Nonetheless I think it's very instructive to look at how the composition has changed over time, since a change in interest rates today is likely to

have a very different impact on investment portfolios than a comparable change might have had ten years ago. Of particular interest is the significant increase in pre-payment-sensitive mortgage-backed security (MBS) holdings and the offsetting decrease in direct commercial and residential mortgage loans. I would also note the decrease in policy loans as a percent of assets.

Table 3 shows the average net earned interest rate for life company portfolios for each of the last ten years, again based on data collected by the ACLI. Unlike the previous table, this data is for general accounts only. Note how the earned rate remained rather "sticky" through the first several years of market rate declines in the 1980s, but has decreased markedly the past few years.

CHART 1
HISTORICAL INTEREST RATES (10-YEAR CMT)

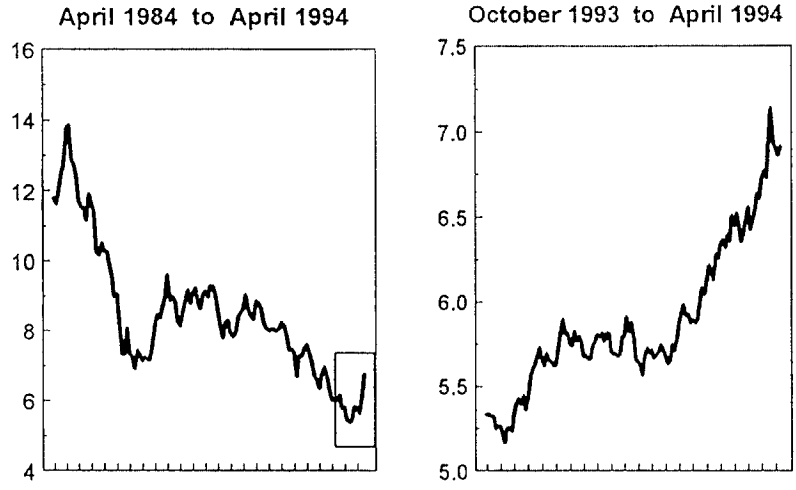


CHART 2
HISTORICAL TWO-YEAR/THIRTY-YEAR INTEREST RATE SPREAD

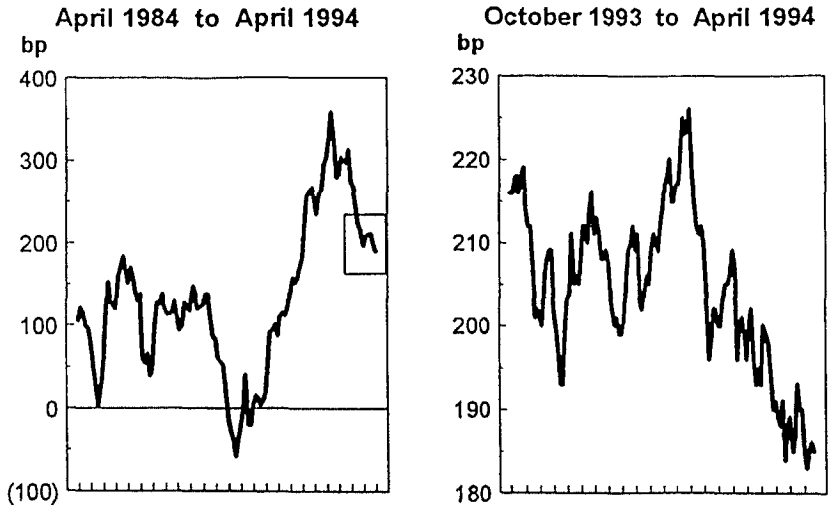


TABLE 1
HISTORICAL RELATIONSHIP OF YIELD CURVE
SLOPE AND REAL GDP GROWTH TO
CHANGES IN INTEREST RATES (1954–92)

Average for year in which the 3-mo/10-yr slope was:	Subsequent 1-yr growth in Real GDP	Subsequent change in 10-yr yield over 1 yr	Subsequent change in 10-yr yield over 2 yr
> 200 bp	3.3%	−113 bp	−153 bp
100–200	4.3	20	42
0–100	2.9	15	53
Inverted	0.1	70	50

Source: H.C. Wainwright & Co.

TABLE 2
LIFE INSURANCE INDUSTRY ASSET DISTRIBUTION
(INCLUDING SEPARATE ACCOUNTS)

	12/31/83	12/31/92
Government Bonds	8.1%	8.5%
Corporate Bonds	35.2	36.0
MBS	3.9	14.9
Mortgage Loans	23.1	14.8
Stocks	9.7	11.5
Real Estate	3.4	3.1
Policy Loans	8.3	4.3
Other	8.2	6.8

TABLE 3
LIFE INSURANCE INDUSTRY NET EARNED RATE
(EXCLUDING SEPARATE ACCOUNTS)

1984	9.65%
1985	9.87
1986	9.64
1987	9.39
1988	9.41
1989	9.47
1990	9.31
1991	9.09
1992	8.58
1993E	8.18

I'd like to turn now to our topic for this session. Joining me on our panel are three distinguished individuals that I am very pleased to have with us. Each of them will be approaching the question, "are we prepared for interest rates to rise again?" from a different perspective. Our first speaker is Shane Chalke, who is well-known to many as founder and president of Chalke Incorporated. Shane is also a Vice President of the Society and a past chairman of the Product Development Section. Shane's assignment is to address the subject of rising interest rates from the perspective of implications for insurance liabilities and product management.

MR. SHANE A. CHALKE: I'd like to start my comments with the observation that the current state of the industry on the liability side of the balance sheet is very good. In general, I'd give us a good report card for learning some lessons from the infamous 1979-81 period. We run our business quite differently now than we did during that time period. For example, there is far less duration mismatch between asset/liability portfolios today than there was in 1979. At that time it was not unusual to see asset portfolios that were twice as long in duration as the average insurance company portfolio today. Through the 1980 and 1990s there has been a growing recognition that liabilities are shorter than we used to think they were. We now know that the length of time a product stays on the books is not necessarily well-correlated to the duration of that product.

I think we also design products better. We've seen quite a number of changes on the liability side in terms of product design, particularly in the areas of options and interest rate crediting. First, with respect to options, our products generally do not have as many options in them as they did ten years ago. We went through quite a creative period of product design in the early 1980s which saw the development of a number of concepts that were heavily option laden. We invented almost every way under the sun for people to take money out of the contract.

Fortunately, much of that built-in optionality has now faded from our product designs. Second, with respect to crediting strategies, I believe we are doing a much better job of managing this now than five years ago. Investment generation methods are more widely used, and there is far less of what I would call naive use of portfolio crediting methods.

Finally, products in general are much more profitable now than they were a few years back. This is partially our own doing and partially due to external forces. There has certainly been a flight to quality that has arisen from unfortunate circumstances in our industry. For many companies this has been a net positive, as people are now much more willing to pay for quality. Through the mid-1980s many of our clients were unwilling to pay for quality, as price (or credited rate) became the only consideration in a commodity-like market. Another factor contributing to increased profitability is that, frankly, some companies finally "hit the wall" in terms of profitability. With one product iteration after another, pricing became more and more aggressive until even the most optimistic assumptions produced only minimal margins. We've seen a number of companies that have now retrenched and decided that additional volume at zero or negative margins does them little good.

Notwithstanding all the good news there are a few negatives and a few complacencies that do give me cause for concern. The first is somewhat of a renewed reliance on forms of traditional business, particularly traditional life insurance. Now, there's nothing intrinsically dangerous about traditional life. I'd say, however, that the implied method of transmitting interest earnings to the policyholder through traditional business is perhaps more dangerous from the company side than explicit interest crediting. That implied method happens to be portfolio rate crediting. I think many people recognize that crediting on a portfolio rate basis leaves a company quite vulnerable to a rising interest rate environment. In addition, crediting on a portfolio rate basis over time never really averages out to have the same performance as crediting on a marginal rate basis. The reason is counter-cyclical cash flow. When interest rates rise cash flow slows as the credited rate becomes less competitive, which in turn slows the portfolio rate adjustment. Conversely, when interest rates fall cash flow accelerates as the credited rate becomes very competitive, and the portfolio rate falls more rapidly than it otherwise would have.

My fear is that the reliance on traditional business and implied portfolio rate crediting will leave many companies in the same situation that they experienced in the late 1970s, facing the question of breaking off new portfolio segments in order to remain competitive. Such segmentation may indeed preserve competitiveness, but it also runs the risk of "bleeding off" existing business. Today's much more sophisticated consumer base compounds that risk. I would postulate that the average client today is probably reading page C-16 of *The Wall Street Journal* in order to determine the best time to lock in the refinancing rate on his or her home mortgage. In 1979 many of these same folks wouldn't even have known where to buy *The Wall Street Journal*. Information about investment alternatives is much more rapidly transmitted now, and much better understood by a consumer base that views its investments as increasingly portable.

Another concern I have is that interest crediting rates are still generally based on assets with too long a duration. While many companies have recognized that their liabilities may not be as long as they once thought, they have been shielded from having to fully reflect this in their investment strategies through the good fortune of a falling interest rate environment. As interest rates rise, however, they may have to shift their practices fairly dramatically. Essentially, declining rates equal longer liabilities and rising rates equal shorter liabilities. That's almost a truism. But I don't know if the behavioral methods to react to that appropriately are in place yet.

Last but not least among my concerns is the cost of distribution. I believe that distribution is still too expensive. Now, what does this have to do with interest rates? Well, I believe quite firmly that the cost that this industry can bear in terms of distribution is intimately tied to the trend in interest rates. When interest rates are declining, liabilities are long and we can afford to pay more for distribution and amortize the cost over longer periods of time. When interest rates are rising, liabilities are short and we face enormous pressure on distribution system costs.

What was one of the major topics of concern in the 1979-83 period? It was the cost of the distribution system. There was more experimentation done with more alternative compensation schemes and more alternative distribution mechanisms during that time period than there has been in the entire time since. With the stabilization and decline of interest rates, discussions about distribution cost quietly faded into the background and little change was accomplished. I suspect, however, that in a rising-rate environment distribution cost would quickly move back to the forefront among issues of concern to life companies.

Looking forward, I think the most important research we need to do on the liability side and the most important level of activity that we need to engage in as actuaries is behavioral modeling. We have made some progress here. In the mid-1980s behavioral modeling was just at the very beginning of our thought process. At that time we had a few fairly crude models that were built essentially around one independent variable, namely, how your credited rate compared with some phantom competitor. Now we are seeing significant improvements in behavioral modeling, especially within the last year or so. We're seeing actuaries do wonderful regression analysis on competitors' rates vis-a-vis the term structure of interest rates. We're seeing a far better understanding of how competitors behave and react in different environments, and how we ourselves are likely to respond in those same environments.

Today's models also do a much better job of modeling policyholder behavior and taking into account such things as the distribution system and policyholder "seasoning." What causes a policyholder to take loans or partial surrenders, to lapse a policy, to skip a premium payment or make an extra payment? What is the "temperature" of the money coming in the door? Was it sold at the 99th percentile or the 67th percentile of available credited rates? All of these questions are important to understand the dynamics of insurance liabilities.

I'll also say that we're beginning to see models that are relatively more sane in terms of the elasticity component. By elasticity, I mean how the lapse function behaves when credited rates drop to guaranteed levels or fall significantly below competitor rates. In the early days when this was a very new art form to us, you would see some fairly crazy assumptions in terms of elasticity. Now people recognize, for example, that there's almost nothing you can do to get a 100% lapse rate in one month.

Behavioral modeling for insurance liabilities is sometimes discussed as analogous to prepayment modeling for mortgage-backed securities. We are certainly not in a position today of developing behavioral models with the rigor with which such models are developed in the mortgage research area. There's a couple of reasons for this. The first is data. In the mortgage market you have reams and reams of homogenous

data that lend themselves well to statistical analysis. On the liability side we do not have any homogeneous data. However, even if we did have homogenous data, we're further bamboozled by the problem that we have essentially floating rate liabilities. Anyone on the mortgage side will tell you that developing a prepayment model for adjustable-rate mortgages is a problem that is much more difficult than developing a model for fixed-rate mortgages.

I do think that we could do a better job with some of the factors that drive behavior on the liability side. I think that we should be paying attention to things like geographic location. There is one theory that says that coast money is more elastic than midwest money, which may well be true. We may also want to pay more attention to age, sex, demographic category and seasonality. I think that even without outside data there are elements that we can perform statistical analysis on within our own companies to develop better models of behavior.

All of this brings me to my prime concern as we go forward from this point, which is dealing with the concept of a continuous versus discontinuous external environment. If you look at where the major problems within our industry have historically arisen from, they are almost always attributable to discontinuous events. These events include such changes as the explosion and implosion of the noninvestment-grade bond market, the precipitous fall in real estate values and rise in commercial mortgage defaults, the advent of universal life in the face of an almost purely traditional business-based industry, and more than one tax code revision. Now, these changes were not entirely unforeseen in the short-run as they started to emerge. However, when you are doing analysis 5, 10 or 15 years out it is extremely difficult to even imagine what tomorrow's discontinuities will be like.

The greatest risk that our industry faces in the event of a sustained rise in interest rates is that which may arise from a discontinuous behavioral event. My primary concern is that a discontinuity in the fundamentals of the marketplace may affect the efficiency of policyholder behavior. What am I talking about? Well, most of our liability modeling anticipates inefficient policyholder behavior, just as prepayment modeling in the mortgage market anticipates inefficient homeowner behavior in refinancing or otherwise prepaying mortgage loans. Changes in the efficiency with which policyholders exercise the options imbedded in their contracts would have a major impact on the profitability and competitiveness of most life companies today.

What kind of discontinuities am I thinking about? I can point to some examples in the past. When money market mutual funds came on the horizon, they caused considerable problems for the banking industry. Their emergence caused a disconnect from the way that business had been done previously. More recently, we've witnessed an increase in what the press calls the "financial shrewdness" of American homeowners, referring to their increased understanding and use of the refinancing option. What are the implications for our industry of this increasing sophistication? Just recently, we've seen the regulatory approval of a tax-deferred "retirement CD" now being offered by a bank in Montana. This is another potential disconnect in our business that worries me.

There are two things that are really the drivers of inefficient behavior—lack of information and high transaction cost. Our industry benefits from both of these.

However, both of these can be overcome by technology. What if someone went to the effort of creating a business that had in its database all of your rates and values for all of your products? And what if this service found its way into your home via America On-Line or Prodigy? You, as a consumer, could pull up your annuity contract onto your screen, check your values and surrender charges, and then run an instant comparison and break-even analysis with comparable products from 13 other companies. That's a scary scenario, but with the cost of information plummeting so rapidly, it's also becoming a more realistic scenario. And what makes it even more scary is that the transaction cost for this service might be as much as the effort it takes to click on the little button in the bottom right-hand corner of the screen for immediate execution.

How do we respond to this potential change in policyholder behavioral efficiency. Number one, we need to be aware of it. Number two, I think it is very important that we stress test our operations to understand what the potential economic implications are. Let's start thinking about modeling discontinuities. And finally we need to consider the ramifications that this might have for our regulatory structure, particularly as it relates to nonforfeiture laws.

MR. BOUSHEK: Our second speaker is Bob Clancy. Bob is currently a vice-president and fixed-income portfolio manager for Standish, Ayer and Wood. Among his other distinctions, he is also a former Halmstad prize winner for his paper on "Options on Bonds and Applications to Product Pricing." Bob's assignment today is to address the subject of rising interest rates from the perspective of implications for invested assets and portfolio management, with a specific focus on the area of mortgage-backed securities.

MR. ROBERT P. CLANCY: As Randy said, I'm going to be focusing on the asset side of the equation. Specifically, I plan to touch on four topics—the extension risk inherent in mortgage-backed securities, various aspects of modeling this risk, some of the factors and considerations that one needs to take into account when modeling this risk; and finally observations on the broader investment markets in general.

Before I get into discussing extension risk on mortgages, I'd like to talk about a couple of different frameworks for analyzing this risk. First, there is the classic actuarial framework wherein you project asset/liability cash flows scenario by scenario and period by period. Positive net cash flows are assumed to be reinvested at currently prevailing interest rates and are accumulated out to some distant horizon. At the end of the horizon period, total accumulated wealth may or may not be discounted back to the initial time period. Alternatively, investment managers tend to look at things more in terms of present values and prices and price changes. A typical investment manager approach would be to project cash flows for a six-month or one-year horizon, and then try to determine a fair market value for what's left at the end of the horizon period. Either way, however, the analysis should tend toward rather similar conclusions. The risk/return trade-offs should be evident, and you should be able to find similar vulnerabilities to good or bad scenarios.

To illustrate what I mean by extension risk in mortgages, consider two different scenarios. First, there are level rates. Second are rates up by 200 basis points for two different securities: a 30-year Government National Mortgage Association

(GNMA) 9.5% pass-through and a 30-year GNMA 6.5% pass-through. If you were to graph the expected cash flows for the GNMA 9.5% under these two scenarios you would note that in the up-by-200-basis-point scenario the total cash flows (principal and interest) are lower than those in the base case scenario for the first four years, and higher thereafter. Graphically, the cash flows can be extended further out on the page. The same pattern is evident for GNMA 6.5%, except that the payments are lower for the first nine years before becoming higher over the remaining life of the security. The cash flow extension in this case is much more graphically evident and serves to make the point that different mortgage-backed securities are subject to very different degrees of extension risk. In both cases, however, the bottom line is that in a rising rate environment you receive lower prepayments to invest at higher interest rates while discounting increased future cash flows at the same higher rates, resulting in a decrease in the economic value of the security.

Now consider an interest-only (IO) security under these same two scenarios. In this case the only cash flows to the investor are the interest payments from the underlying mortgages. In the up 200 scenario, refinancing incentives drop markedly for the borrowers. Principal repayments can be expected to decline, increasing the interest payments made over the life of the security. The cash flows obviously extend, but the value of the security increases as higher cash flows are expected over each year of the security's life. As a result, this security exhibits negative duration, i.e., price movement that is positively (as opposed to inversely) correlated with changes in interest rates.

I find that there are two ways to evaluate extension risk. The first is scenario analysis which, as I mentioned earlier, can take one of two forms—cash flow discounting or horizon total return. The second involves the use of a measure called convexity. Convexity can unfortunately be defined in various ways, as there is no standardization of the term. However, in general it is related to the rate at which duration will change on a security as interest rates change. Mathematically, you can think of it as the second derivative of the price of a security with respect to yield. If convexity is negative it tends to measure extension risk in a rising interest rate environment as well as call risk in a falling rate environment.

Table 4 illustrates the use of duration and convexity as risk measures. The two securities here—a five-year Treasury note and a 30-year GNMA 9% pass-through have roughly comparable initial durations. Using a sophisticated option-adjusted spread model, we can project the total return for these two securities for a six-month period under an up-by-100-basis-point scenario. In this particular case the GNMA is projected to produce a negative return of 1.08% (inclusive of its coupon) versus a loss of 0.08% for the Treasury note. Now, if I had instead estimated expected returns using duration as a shortcut, I would have come up with a projected loss of 0.16% for the GNMA and 0.52% for the Treasury note. The difference in my projected returns is −0.92% for the GNMA and +0.44% for Treasury note. This result reflects the magnitude of the extension risk in the GNMA. Notice also that the convexity measure calculated for these securities is of roughly the same order of magnitude as the differences in estimated returns.

TABLE 4
MORTGAGE EXTENSION RISK
SIX-MONTH HORIZON: +100 BASIS-POINT SCENARIO

	GNMA 9%	5-Year Treasury
Projected Total Return	−1.08%	−0.08
Projected Total Return Using Duration	−0.16	−0.52
Difference	−0.92	+0.44
Duration	3.99	4.20
Convexity	−1.03	0.10

In order to get a good handle on the extension risk in mortgage-backed securities one really needs to get a good handle on the critical assumptions. Shane perhaps made this sound a little bit easier than it really is. Undoubtedly, it is easier to try to get a handle on prepayments for mortgages than on lapse assumptions for deferred annuities; however, that still doesn't mean it's easy by any means. There are any number of factors that influence the prepayment function: the interest rate, loan term and loan age of the underlying mortgages, the level of interest rates, the slope of the yield curve, the number of previous refinancing opportunities, the time of year, etc. It all starts to get rather complicated. And even though there's a great deal of data out there, there isn't enough data to produce much uniformity in prepayment forecasts.

Let me add a couple of practical observations on prepayment considerations. First, I would argue that today's environment currently places us in uncharted waters for prepayment modeling. Late in 1993 we were at 30-year lows for mortgage interest rates. That makes it hard to feel real comfortable about statistical analysis which builds future projections on the basis of past experience. We also must face the fact that Wall Street firms, as you all know, have been doing billions of dollars worth of business in mortgage-backed securities for years now. They hire many very bright analysts whose sole job it is to try to figure out how to model mortgage prepayments. For the last several years, all of these firms have been constantly rolling out "new and improved" versions of their models, as greater and greater actual-to-expected variances emerge. That also makes it difficult to feel comfortable about any one current model. I would suggest that increased sensitivity analysis for various prepayment assumptions is not only prudent but absolutely necessary in today's environment. One suggestion might be to test your results at not only 100% of your prepayment model speeds, but also at 80–120%.

A couple of other real-world observations that you should take into account when looking at asset risks in a rising-rate environment are spreads and the yield curve. Yields on corporate bonds and mortgage-backed securities, whether nominal or option-adjusted, tend to lag Treasury rates. If Treasury rates move up 100 basis points, yields on corporate bonds and mortgages may move up perhaps 80 basis points, which results in a narrowing of the yield spread. If Treasury rates drop 100 basis points, yields on corporate bonds and mortgages may drop 80 basis points, resulting in a widening of the yield spread. Such spread changes can prove to be very significant. Understanding the spread sensitivities of a security or portfolio of securities to changes in interest rates is an important aspect of investment portfolio

management. And just as interest rate durations can be used to measure the price sensitivity of a bond to changes in interest rates, an analogous measure known as "spread duration" can be used to measure the price sensitivity of a bond to changes in spreads.

With respect to the yield curve, Randy displayed a chart earlier that illustrated the unprecendently steep levels of the yield curve in 1993, and the significant flattening that has occurred since then. The assumptions imbedded in the yield curve are suggesting that this flattening is likely to continue. Now, we know that in the real world we tend to get nonparallel shifts of the yield curve much more frequently than we get parallel shifts, which casts some aspersions on the validity of duration and convexity measures. Nonparallel shifts can affect mortgages, in particular, in very different ways. Refinancing alternatives play a significant role in the mortgage prepayment function. A steep yield curve begets more such alternatives, as adjustable rate and balloon mortgages become attractive options to many borrowers. The yield curve also affects the value of these securities in the way that one discounts future cash flows. The more that cash flows are "front-loaded," correlating to higher coupons and faster prepayments, the more sensitive a security is to what's happening on the short end of the yield curve. Analyzing the vulnerability of a portfolio to parallel changes in interest rates provides only a partial assessment of the interest rate risk imbedded in that portfolio. Prudence also dictates that testing should be done for various nonparallel yield curve shifts as well.

Finally, I'd like to offer a comment on the market in general. You've heard a number of comments about rates rising rapidly and about extension risk and about how this is bad for bonds and mortgages, etc. You may be thinking, as one of my clients said earlier this year, "Maybe I should be liquidating many of my fixed-income investments now and going into stocks." Well, maybe it's right to be somewhat fearful about what can happen in the bond market in a rising-rate environment, but it's a bit premature to conclude that stocks may be a safer haven in the same environment. For evidence, just look at what has happened in the U.S. equity markets in the last couple of months that followed the Federal Reserve's tightening moves. Stocks have sold off as a case of nerves has definitely overtaken market optimism. For a more extreme case you may want to look at the experience of 1987, when a rapid rise in interest rates ultimately led to stock market indigestion and a 500-point one-day drop.

Can equities be a valid asset class? And can they be a good alternative in a rising-rate environment? They probably can be if the rising-rate environment is not coupled with inflation fears but rather with slow, moderate growth in the economy. However, in all situations stocks can obviously only be considered a valid asset class if a company has the capacity to absorb potential losses in its surplus account.

MR. BOUSHEK: I'd like to follow up on one point that was made in conjunction with your comments on the shape of the yield curve. One of the questions that has been raised frequently is whether or not policyholder lapse behavior can become as extreme as homeowner refinancing behavior. I think that policyholder behavior, much like homeowner behavior, is heavily influenced by the shape of the yield curve and the availability of competitive alternatives. A steep yield curve has provided homeowners with refinancing incentives that are not as viable in a flatter yield curve environment. Similarly, but conversely, a flatter yield curve (especially one that becomes inverted)

could easily provide many more disintermediation incentives for policyholders. As with mortgage prepayments, changes in the slope of the yield curve could well amplify the impact of rising or falling interest rates on policyholder behavior.

Our final speaker is Prakash Shimpi. Prakash is a managing director in Chase Manhattan's Global Insurance Group, where he is responsible for providing asset/liability management services and derivatives transactions to insurance clients both in the U.S. and abroad. In addition to being a Fellow of the Society of Actuaries Prakash also holds a certificate in actuarial techniques from the Institute of Actuaries in the U.K. As our cleanup hitter, his assignment is to address the subject of rising interest rates from the perspective of management responses and implications for financial reporting.

MR. PRAKASH A. SHIMPI: By now you've heard all the great news about what can happen to assets and liabilities from my colleagues on the panel. The question is what do we do about it? Well, in the same way that a property/casualty insurer might look to the catastrophic reinsurance market for relief from the risk of a major hurricane or earthquake, I'd like to look at the hedging instruments that are available in the capital markets that provide a form of catastrophic reinsurance for interest rate risk. What I'm going to talk about today is the use of interest rate derivatives—swaps, caps, floors, etc.—for managing that risk.

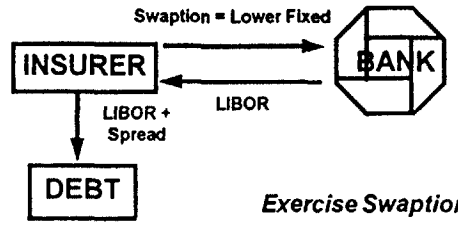
Just what do derivatives do for you? In a nutshell, they change the profile of your portfolio. And how do they do this? Derivatives change the cash-flow characteristics of a portfolio in two significant ways: (1) by affecting the timing of the cash flows, and (2) by controlling the circumstances under which they come in.

Where you sit in a company has much to do with how you prepare or respond to changes in interest rates. I'd like to take a look at this from three different perspectives. In the first case, let's assume you're sitting at the corporate level and you're about to buy a small life insurance company. Much work has already been done, and you're reasonably certain the deal will be completed in about six months. You're main concern is funding the purchase. You would like to use the floating rate debt market because that provides you with your most efficient access to capital. However, you plan to effectively convert your debt to fixed rate via the swap market. Your risk between now and closing is that interest rates will rise and increase your cost of funding. The solution in this case may be to purchase a *swaption*.

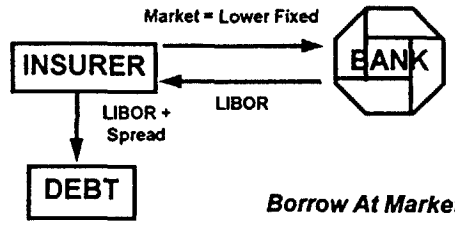
What is a *swaption*? Well, let's look at Chart 3 to see how one might work in this case. A swaption, or swap option, gives you the right to enter into a swap agreement at a later date on terms agreed upon today. In this particular case you've paid a premium today for the right to enter into a fixed/floating interest rate swap six months from now, with swap payments based on the London Interbank Offered Rate (LIBOR) and today's long-term interest rates. If interest rates rise, you can exercise your option at closing and lock in today's lower rates. If interest rates fall you can let the option expire and lock in tomorrow's lower rates with a swap on new terms at that time.

CHART 3
SWAPTION

Later: A. Rates Rise Over Strike



Later: B. Rates Stay Below Strike



Now let's move onto something more fun. In the next case, let's assume that you are managing a product line. Shane had some very interesting remarks earlier about the fact that we're now giving away fewer options to our policyholders. I think that's a very good thing. In fact, I've recently become more and more involved with companies who are trying to develop their crediting strategies in the product design stage.

In a number of these situations, we've created derivative strategies through swaps or structured notes that have embedded within them the features that allow the insurance company to take out their spread and pass the rest of the performance onto the policyholder. In this particular case, however, let's assume you have a deferred annuity portfolio with a credited rate that tracks the yield on the five-year CMT. The investments supporting this segment are traditional fixed-income securities.

Your concern, obviously, is your ability to maintain a competitive crediting rate in a rising-rate environment. Let's say you also have some capital loss constraints to deal with, so liquidating bonds at a loss to fund increased lapses is difficult. A solution in this case might be to enter into a CMT swap in which you would receive from the bank counterparty a floating interest rate equal to the five-year CMT rate at each

payment date, in return for a specified fixed rate that should mirror the yield on your investment portfolio less a spread. As interest rates rise, you will be a net receiver of funds on the swap and will be able to maintain your crediting strategy. If rates fall you will become a net payer of funds on the swap, but you will still be able to adhere to your crediting strategy.

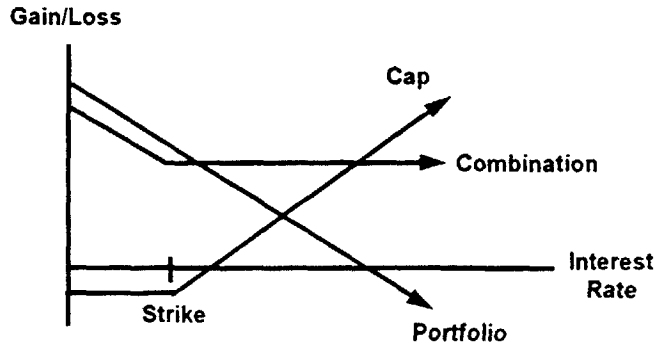
So far I've concentrated on plain-vanilla transactions. In truth, swaps and caps and all other derivatives come in many flavors and can be used in many different combinations. In this last case, for example, we might want to add a floor to the portfolio to ensure that we are always covering the minimum guaranteed rate on the annuity. We could also get into so-called *exotics* which have a number of dependencies built into the cash flows. The third and final case I'd like to look at takes us a little further in that direction.

In this case, assume that you are having to designate a number of your fixed-income assets as held-to-maturity under *FAS 115*. Assume further that you currently have a substantial unrealized gain on those assets that you would like to preserve. If interest rates rise that gain will disappear. One way to protect that gain would be to buy interest rate caps. However, you believe the premium for that kind of insurance is just too expensive. So what's a portfolio manager to do? Well, one possible solution might be to cheapen the cost of the caps by incorporating into it something known as a knock-in barrier provision.

Normally an interest rate cap pays out any positive difference between current interest rates and the strike rate in the contract. The gain/loss profile of a cap, with its uniformly increasing payout, is illustrated in Chart 4. You may decide that you can withstand the effect of interest rates rising modestly over the strike rate, to a point. If rates reach that point, then you would like the protection of the cap to kick in, with benefits based on the lower strike rate. The lower half of Chart 4 illustrates the altered gain/loss profile of this cap. The point above the strike rate where payments are triggered is known as the knock-in barrier.

I'd like to leave you with a couple of thoughts. Derivatives are not the kinds of things that can be locked away in a drawer once they're in place. They require constant monitoring, individually and collectively, to ensure that you've taken proper account of all risks involved. For example, one thing we haven't discussed at all in this session is counterparty credit risk. There are also profitability concerns that can't be ignored when it comes to considering the cost of options, swaptions or caps and floors in a portfolio.

CHART 4
INTEREST RATE CAP



KNOCK-IN BARRIER CAP